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We care of every kind of traffic on land and over land, on sea and under sea.

Naval measures incident to the safeguarding of New York city have brought to the front still another need. The development of the submarine means that New York harbor must be adequately protected. At the present time we have the Brooklyn navy yard, crowded to the limit with men and ships, and we have a little patrol boat harbor that belonged to an amusement park on the verge of Gravesend Bay.

These are practically all, except the open waters of the inner harbor through which ships and tugs and barges are moving in every direction, and as we have seen during the last seventy days, sometimes desperately fighting ice. There is needed, therefore, also an ice free submarine and patrol boat base. No scheme of port improvement which omits any of these factors is at all adequate to the needs of to-day and to-morrow.

We have to consider for New York the site where such a grouping of commercial facilities could be made with favorable conditions for each of its elements. The study of a site must accept as a first premise that the population of New York and its satellite cities will be doubled and tripled within the lives of young people now living. Another certainty is that the dimensions and tonnage of passenger and cargo carriers will increase and not diminish. We already have very nearly the 1,000 foot ship and any project must fail of perfection which does not recognize this fact and tendency.

New York Bay Incomparable.

The sweep of waterfront for this metropolis is quickly passed in review. Our New York Bay is an incomparable focus of tributary waterways—the East River connecting with Long Island Sound, the Kill van Kull and the Arthur Kill bounding the northern and western sides of Staten Island and affording access to Newark Bay and Hackensack, and the lower reach of the Hudson, which is known as the North River.

The great city has passed over all of these waterways with a glacierlike advance. The cross river of the Harlem defile, which the cattle of the old Dutch settlers used to ford between Manhattan Island and the mainland, now The Bronx, has become a strait, a sinuous one to be sure, spanned by many bridges and underlaid by passenger tunnels. Neither the Harlem nor the East River north of the Brooklyn Bridge could ever be the site of docks which a 1,000 foot ship could enter and leave.

Where the charity islands are, where the currents of Hell Gate swirl, was once a cataract, then a tumultuous rapid, now a crooked channel where the tide made waters boil. The rock bottom of Hell Gate and the nearby islands are a barrier that fifty years of agitation have not made suitable for navigation by a modern battleship, let alone by a Leviathan. No project in The Bronx or on the north shore of Long Island could be acceptable where such a barrier intervened between the waters of the Sound and New York's inner bay.

Never Should Be Lightered.

We may enunciate another principle: namely, that gross freights, raw materials and manufactured products destined for export from or import to the territory west of New York ought never to be dragged under or over the East River or North River by ear or barge, even to such a conception as a glorified Bush Terminal. These are just the freights which should be excluded from the metropolitan area in order to conserve the waterfront spaces needed for the city's own use.

The Pennsylvania tunnels cannot be given over to such freight—these are indispensable to the service of the people. How could Montauk Point, forever menaced by sunken rocks and reefs, or Jamaica Bay be made ocean export and import terminals within fifteen or even twenty years save by a huge system, new tunnels under the Hudson, under Manhattan and under Brooklyn, to say nothing of preparing docks and approach channels through the westward driving sands on the south littoral of Long Island, which in 125 years have moved the inlet to Jamaica Bay seven miles westward. Huge jetties extending far seaward similar to those at Galveston would be needed to make and maintain a forty foot channel at low tide into Jamaica Bay.

To Montauk Point it would take, in addition to the vast tunnel and track system, over 100 miles of additional rail haul. This is a tax prohibitory, except perhaps to passenger traffic (Yarling, *Atlantic*)



Map of New York harbor, showing possibilities of development.

for holidays or homeward bound. It is a postulate of ocean freight movement that ships seek the deep water facilities nearest to the sources of production. Montauk Point does not fulfil this requirement. Jamaica Bay has its destiny, an assured destiny of industrial activity and the comings and goings of barges and cargo craft not drawing over twenty-five feet. The great ships which experience has taught us carry ocean freight the cheapest will not home there.

The Kill van Kull and the Arthur Kill, bounding Staten Island on the north and west, give access to waterfront spaces with potentialities like unto those of Jamaica Bay, in the flats of Jersey, Newark Bay, the Passaic and the salt meadows of Hackensack. These areas will be the sites of infinitely diversified manufactories and they will bring to myriad docks fleets all their own. But these are not the frontages for serving best the products and imports of the West, mightier than even the most ardent proponent of New Jersey greatness can envision.

Continuity of Line Broken.

By this process of elimination we are brought to the shallows of the east front of the Bayonne Peninsula from the Morris Canal basin to its southern tip. Its west front is barred by bridges to the mainland. The industries already strung along its shore break the continuity of any comprehensive project. The Bayonne peninsula has no places for homes and the best use that can be made of its Bay front is to dedicate it to the service of such industries and railways as have preempted it.

Great to-day, they must become far greater and need larger frontages and many betterments as the population of New York goes on its massive way to uncounted numbers. Before the Morris Canal basin project could be realized the great city will be ready to swallow all the services it could render.

When a final pier head line has been established for the Bayonne frontage and for the east shore of Staten Island with due regard to the principles of harbor and river regulation it will be found that the shore of Staten Island from St. George to the Narrows is inadequate and unsuitable to multi-railway freight terminal development. It might be an ocean passenger convenience, but this has distinct limitations and most liners carry both freight and passengers and hence both are best served together.

The Bush Terminal on Brooklyn's front, which faces west, will grow and grow, but all its growth is needed for the greatest city of all time, and why should the exports and the imports of the people west of the Hudson be put to paying a perpetual lighterage tax across the stream?

We come then to the lower Hudson, to which all others of New York tidal water lanes are subordinate, the east front of New Jersey and the west side of Manhattan.

The new motor freight tunnel under the Hudson, to which the Joint State Commission has just pinned a pious faith, will be an extremely useful accommodation. It too would be only the beginning of waterside improvements which would be all absorbed by the growth of the city by the time they could be built, connected up and put into operation.

Time is the essence of war relief, of fuel relief, of suburban and of urban relief, of freight relief; time is the essence of war success. Where can it be served quickest, surest, safest? Not by a new truck freight tunnel under the Hudson, desirable as it is; not on the North River, not on the Bayonne peninsula, not on the Newark flats, not along the east and north shores of Staten Island, but just upon the setting in the lower bay where this new harbor is advocated.

A new national terminal for ships, air craft and cars should satisfy a number of primary requirements.

1. The site should be naturally secure from flood, ice, wave and wind, both for ships and air machines, or one that can be readily made safe.

The south shore of Staten Island satisfies these requirements. No flood can harm from river or from ocean. No ice floes can assail or freezing hamper the movement of craft. No harmful wave can from any direction cross the shallows and the breakwater walls which defend the new waterway to the piers or the inclines of the hydroplane bay and the submarine and patrol basin which opens on the channel.

Site Fully Sheltered.

No wind need embarrass movement either on the water or in the air, as the site is fully land sheltered from the west and from the north. The axis of the approaches to all docks and landings runs southwest and northeast, directions most propitious for handling air and water craft, having regard for prevailing winds. From the south and southeast the angles of the docks defend shipping. From the east there is but a short wind reach across the waters of the Narrows to the entrance. When at dock ships would meet the worst winds end on.

2. The water approaches to the site should be favorable as to depth and to all conditions of navigation. The selected location on Staten Island has all the advantages one could ask from this standpoint. Nothing better exists at any entrepot of commerce in the world.

The entrance for ships will never need a dredge or an ice breaker; it is scoured by the currents of the Narrows. The western end would be provided with a sea gate to be so manoeuvred that new water would circulate with the tidal swing, but that no silt would deposit in the long reach which gives access to the piers or in the slips which separate them.

3. Behind the slip system in the selected site there would be ample area for business purposes, and the ground should have a gentle drainage slope. The business section would be on Staten Island, nearly a mile wide.

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4. A raised section should be available for residential purposes. No better sites exist anywhere than the splendid Dongan and adjacent hills, which overlook the terminal and have the farthest view to sea. They are the highest lands upon the Atlantic shore line from Florida to Maine.

5. The selected site there should have access from and to the mainland by belt line and easy grades connecting all the grand trunk lines to New York. Over the Arthur Kill there is place and room for several outer belt railways and several bridges. There is room for a thousand miles of storage and sorting tracks on the island and adjacent mainland.

Besides these there is surface connection with the Baltimore and Ohio and the Staten Island Public Service systems. A tunnel under the Kill van Kull to Bayonne would complete an inner belt line linking up all the Jersey docks and freight yards. There is now a great ferry service to Staten Island. A greater one is possible direct to the new entrance. In good time will come subways and railways under the Narrows to Manhattan, Brooklyn, Long Island and New England.

Expansion Easily Possible.

6. Expansion should be possible, since New York and the United States back of it must surely grow. A similar improvement may extend clear to Tottenville, doubling the first stage here advocated. Again, to the southward the design may be repeated half a dozen times and the nearer the massive wharves and filled in land work toward Sandy Hook, the better the continental port of New York and the easier the maintenance of the great channel which leads to it.

In the huge shallow triangle of the lower bay there is room to satisfy the growth of ten such centuries as the last. The material dredged from the Ambrose Channel should have gone there to some far sighted improvement whose need now after only ten years has proved imperative. The 50,000,000 yards wrested from its channel bottom would be worth \$50,000,000 in the right place. A very few cents more per cubic yard would have sufficed; but it was harder to get a hundred thousand dollars for New York harbor than now a billion for the war.

7. Cheap light and power are indispensable. These may be brought to the site selected under highly favorable conditions, for it is the nearest to the coal fields in time and mileage and no lighterage is necessary.

8. Fresh water is available from New York's wonderful system. It might even come from north New Jersey were there need.

9. The site has the coolest summer climate of any section of the greater city and the most equable winter conditions. It is cooled by the southwest breezes and tempered by the ocean in the season of the heat, but it is sheltered from northwestern blasts when all the rest of the city lies open to them.

Has Need of Air Harbor.

10. New York has need of an air and sea patrol harbor, fitted for every service of peace and war. It should have a submarine base as close to the outer sea as is feasible. For the centuries to come sea power and sea front defence will be lodged in the submarine. It will take dominion from battleships and battle cruisers, and from the green lawned forts whose hidden guns can only rise and fire on emptiness.

New York has no patrol harbor save a little set of piers on Gravesend Bay. These are to take care of its frail fleet of minute boats, converted yachts with paperlike skins or the 110 footers which have not met expectations. It has no protection against air raids, almost nothing to-day to make it safe from blockade by audacious submarines or raiding cruisers. The navy yard at Brooklyn is a choke smothered in the city's growth.

11. Every steamer which seeks our port for food for England goes through the Narrows and past what would be the new harbor entrance, the convoys of war, the argosies of peace, the transports, swarming with our devoted boys who go to save England, yes, and to redeem that Belgium whose every paper in our Spanish war upbraided us as corsairs but who earned our tribute of redemption by standing fast for Liberty when minutes stood for centuries at Liege.

The public must realize how greatly and immediately the provision of adequate waterfront facilities could enhance not only our general trade and commerce but also our immediate war efficiency in the shipment of troops and supplies.

This project was first planned by the navy and the army and the civil engineers (Continued on following page.)